CLAIMS

1. A multi-functional and multi-step nanodelivery system having one or more nanoparticles, the nanoparticles comprising:

a. one or more targeting molecules adapted to target the nanoparticle to one or more cells;

b. one or more cellular entry facilitating molecules coupled to the targeting molecules;

c. one or more anchoring molecules coupled to the entry facilitating molecules;

d. one or more drugs or genes coupled to the anchoring molecules; and

e. one or more molecular biosensors adapted to control an intracellular delivery of a quantity of the drugs or genes in a feedback loop at a single cell level.

2. The system of claim 1, further comprising intracellular re-targeting molecules coupled to the entry facilitating molecules.

3. The system of claim 1, wherein the molecular biosensors provide one or more molecular biosensor feedback loops for controlled delivery.

4. The system of claim 1, wherein the targeting molecules comprise an antibody, a DNA, a RNA, a peptide sequence, a ligand, a thioaptamer, or a combination thereof.

5. The system of claim 1, wherein the targeting molecules are adapted to target a desired location with Boolean logic sequences of positive and negative identification.

6. The system of claim 1, wherein the targeting molecules comprise virus-associated or mimicking molecules.

7. The system of claim 6, wherein the drug or gene comprises an antiviral drug or gene.

8. The system of claim 1, wherein the nanoparticle is adapted to produce additional quantities of the drug or gene from an intracellular location.

9. The system of claim 1, wherein additional quantities of the drug or gene are obtained by interaction with one or more targeted intracellular organelle.

10. The system of claim 9, wherein the intracellular organelle comprise a nucleus, a mitochondria, an endoplasmic reticulum, other subcellular parts or regions of the cell, or a combination thereof.

11. The system of claim 1, wherein the molecular biosensor is disposed in the nanodelivery system such that it switches on and off production of quantities of the drug or gene based in the feedback loop at the single cell level.

12. The system of claim 1, wherein the biosensor is adapted to periodically check for an expressed gene and provide the drug or gene based upon an occurrence of the expressed gene.

13. The system of claim 12, wherein the biosensor is adapted to stop the provision of the drug or gene when the expressed gene is inactive.

14. The system of claim 1, wherein the biosensor is adapted to sense intracellular stress-related molecules causing damage to a cell comprising reactive oxygen species proteins generated during radiation, chemical interaction with the cell, or pathogen-induced interaction with the cell, or a combination thereof, and to control the delivery of the drug or gene to at least partially repair the damaged cell.

15. The system of claim 1, further comprising a signaling molecule released upon a reaction of the biosensor and a target molecule.

16. The system of claim 15, further comprising a reporter molecule generated by the signaling molecule.

17. The system of claim 1, wherein the molecular biosensor comprises a multi-fusion protein molecular biosensor that is adapted to locate a target cell or cellular compartment, detect a presence of the target molecule based on the specific reaction between the target molecule and the biosensor, and release a signaling molecule that in turn generates a reporter molecule.

18. The system of claim 1, wherein one or more nanoparticles are coated to reduce cytotoxicity.

19. The system of claim 1, wherein one or more nanoparticles comprise a magnetic nanoparticle.

20. The system of claim 19, wherein the nanodelivery system is adapted to extract at least a portion of the nanoparticles from the cell after cellular entry.

21. The system of claim 1, wherein one or more nanoparticles comprise a semiconductor material core.

22. A nanodelivery system having two or more nanoparticles for delivery of a drug or gene to an intracellular location, comprising:

a. a first nanoparticle having a first targeting molecule and a first component of a drug or gene;

b. a second nanoparticle having a second targeting molecule and a second component of a drug or gene different than the first component;

the drug or gene being adapted to provide a desired reaction upon a successful targeting of the first and second targeting molecules and a combination of the first and second components of the drug or gene.

23. The system of claim 22, further comprising a third targeting molecule, adapted to not bind to a cell of interest, coupled to at least one of the nanoparticles and adapted to at least partially block the reaction between the first and second components upon a successful targeting by the third targeting molecule.

24. The system of claim 23, wherein the third targeting molecule inhibits treatment of non-desired, bystander cells.

25. The system of claim 22, further comprising a third nanoparticle having a third targeting molecule adapted to at least partially block the reaction between the first and second components upon a successful targeting of the third targeting molecule.

26. The system of claim 22, further comprising:

a. one or more cellular entry facilitating molecules coupled to the targeting molecules;

b. one or more anchoring molecules coupled to the entry facilitating molecules;

c. one or more molecular biosensors adapted to control an intracellular delivery of a quantity of the drugs or genes.

27. A multi-functional and multi-step nanodelivery system having one or more nanoparticles, the nanoparticles comprising:

a. one or more targeting molecules adapted to target the nanoparticle to one or more cells; and

b. one or more cellular entry facilitating molecules coupled to the targeting molecules;

the nanoparticle being adapted to manufacture quantities of the desired drug or gene from an intracellular location of the cell using one or more intracellular native components.

28. The system of claim 27, further comprising one or more molecular biosensors adapted to control the intracellular manufacture of the drugs or genes.

29. The system of claim 27, wherein additional quantities of the drug or gene are obtained by interaction with one or more targeted intracellular organelle.

30. The system of claim 29, wherein the intracellular organelle comprise a nucleus, a mitochondria, an endoplasmic reticulum, other subcellular parts or regions of the cell, or a combination thereof.

31. A multi-functional and multi-step nanodelivery system having one or more nanoparticles, the nanoparticles comprising:

a. one or more targeting molecules adapted to target the nanoparticle to one or more cells; and

b. one or more cellular entry facilitating molecules coupled to the targeting molecules; and

c. one or more anchoring molecules coupled to the entry facilitating molecules and adapted to locate at least one nanoparticle at an intracellular selected site for subsequent intracellular drug or gene delivery.

32. A process for producing a multi-functional and multi-step nanodelivery system, acting in an autonomous controlled sequence of events at the molecular level, comprising:

a. obtaining a nanoparticle;

b. coupling a drug or gene to the nanoparticle;

c. coupling a molecular biosensor to the drug or gene; and

d. coupling a cell targeting molecule to the molecular biosensor.

33. The process of claim 32, further comprising coupling a cellular entry facilitating molecule to the targeting molecule.

34. The process of claim 33, further comprising coupling an anchoring molecule to the cellular entry facilitating molecule.

35. The process of claim 33, further comprising coupling an intracellular target molecule to the targeting molecule.

36. The process of claim 32, further comprising coating the nanoparticle with a biocompatible coating.

37. The process of claim 32, further comprising locating the biosensor in the nanodelivery system to control a delivery of the drug or gene.

38. The process of claim 32, further comprising introducing the nanodelivery system into a living biological system and allowing the nanodelivery system to enter a desired cell and perform a repair on an intracellular component of the cell.

39. The process of claim 38, wherein the repair comprises cleaving a virus in the cell to inactivate the virus.

40. The process of claim 38, wherein the repair comprises repairing a radiation damaged portion of the cell.

41. The process of claim 40, further comprising checking for a radiation damaged portion of the cell.